DOCUMENT RESUME

ED 254 540 TM 850 134

AUTHOR Toris, Carol
TITLE Suggested Approaches to the Measurement of Computer Anxiety.
PUB DATE 29 Mar 84
NOTE 19p.; Paper presented at the Annual Meeting of the Southeastern Psychological Association (New Orleans, LA, March 29, 1984).
PUB TYPE Tests/Evaluation Instruments (160) -- Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Anxiety; *Attitude Measures; *Computer Literacy; Computers; Higher Education; Knowledge Level; Projective Measures; Psychometrics; Questionnaires; *Research Needs; *Test Construction
IDENTIFIERS *Computer Anxiety; Computer Users

ABSTRACT

Psychologists can gain insight into human behavior by examining what people feel about, know about, and do with, computers. Two extreme reactions to computers are computer phobia, or anxiety, and computer addiction, or "hacking". A four-part questionnaire was developed to measure computer anxiety. The first part is a projective technique which requires the examinee to draw a scene with a computer in it and write a description. The second part is a computer knowledge measure. The final two sections are a description of one's behaviors involving computer use and an attitudinal assessment of computers. Issues that are particularly important to the study of computer anxiety include: (1) the need to identify what is contextualized by the word "computer", (2) clarification of the relationship between various kinds of anxiety and behavior toward computers; and (3) consideration of the possibility that computer phobia may be functional. The questionnaire is included as an appendix to the report. (DWH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED254540

Suggested Approaches to the Measurement of Computer Anxiety

by

Carol Toris
Department of Psychology
College of Charleston
Charleston, South Carolina

Paper presented at Computer Anxiety: Does It Really Exist? Symposium conducted at the meeting of the Southeastern Psychological Association, New Orleans, Louisiana, March 29, 1984.

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

C. Toris

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

TM 850 134

Suggested Approaches to the
Measurement of Computer Anxiety

Things acquire meaning by becoming associated with contexts. If you find an object in the street and cannot imagine it in any other context, the object will be virtually meaningless to you; in fact, you'll have "found" nothing -- every day we pass right by context-less objects. They hardly merit our attention and capture very little of our time.

In the past few decades, the objects we collectively label as "computers" have been appearing in more and more contexts and acquiring more and more meaning. Because the contexts in which we find -- and place -- computers is ultimately a function of our needs, ideas, abilities, and beliefs, finding out what computers mean to us is actually a way of finding out about ourselves, both as a society and as individuals. It is the point of this paper that psychologists can gain much insight into human behavior by examining what people feel about, know about, and do with computers.

Two extreme reactions to computers are apparently so widespread that the labels that describe them are becoming part of common parlance: computer phobia (or anxiety) and computer addiction (or "hacking"). For example, some people now pursue a profession of assisting computer-phobic employees in various businesses and industries; certainly the computer "addict" can also find employment doing exactly what he or she enjoys.

A number of interesting and virtually untested hypotheses about our relationship to computers can be suggested. Is lack of computer knowledge related to anxiety about computers? Does experience with computers tend to relieve such anxiety? If so, are some kinds of experience more effective than others? Can a person who feels ignorant about computers avoid feeling anxious about them too? Do reactions to anxiety about computers differ? Is it possible that anxiety induces some people to "move away" (phobics) and others to "move toward" (addicts) computers? Can a person remain ambivalent toward computers? If so, how large is this group in our society? Educators may be interested in if and how faculty and students differ in their attitudes toward, knowledge of, and behavior with computers. How does owning a personal computer affect the meaning computers have for us? and so on.

Appended to this paper is a questionnaire that has been used at the College of Charleston in South Carolina in an effort to begin to examine at least some of the questions posed above. The questionnaire consists of four parts:

(1) a projective test modeled after the Goodenough-Harris Drawing Test (1963). This section of the questionnaire asks the respondent to draw a scene with a computer in it and to write a description of the scene (s)he drew. While the function of Goodenough's test was to measure the intellectual maturity of children by their drawings of a person, the potential of a drawing test can be extended to other areas, as some of the responses to the "Toris-Draw-a-Computer" Test presented herein will suggest.

(2) a computer knowledge test -- While standardization norms have not been established for this test, it was constructed on the basis of the information presented in a college level introduction to computing text. Note that an accurate assessment of computer knowledge is encouraged by permitting the respondent to indicate when (s)he does not know (or would be guessing) an answer.

(3) a description of one's behaviors involving computer use

(4) an attitudinal assessment of computers

In the development of their 10-item "Attitude Toward Computers" scale, Reece and Gable (1982) suggested that an appropriate attitudinal measure include Triandis' (1971) three components of an attitude; namely cognitive, behavioral, and affective items. Note that the questionnaire described above considers these components in parts 2, 3, and 4, respectively.

Of the 11 faculty and professional staff and 17 students who were randomly selected to respond to this questionnaire in its current formative state, some interesting response patterns are already suggested; for example, while faculty and students both score quite high on the computer knowledge test (91.5% and 86.6% correct), faculty respond to considerably more questions overall than do students (4.8% versus 28.6% "don't knows") suggesting that while students at least "know what they don't know", faculty know more about computers (at least at an introductory level). Furthermore, while more faculty (18.8%) than students (6.8%) had never used a computer, of those who had, faculty were considerably more likely (70%) than students (26.7%) to be currently using computers. There was little or no difference in the general description of the computer experiences of these two groups as measured by a Likert-scale item where 1 equals very negative experiences using the computer and 5 equals very positive, with the mean faculty response being 3.8 and the mean student response equal to 3.0. A similar percentage of faculty (20.0%) and students (26.7%) had personal computers at home.

It is also worth noting that the overall attitude toward computers as measured by five Likert scale items (describing computers on the positive pole as tools, helps, an aid to society, etc.) was quite favorable. Overall means for faculty on these five items was 4.4 and for students, 4.2 (where the positive pole was equal to 5). A nationwide survey by Lee (1970) indicated that, at the time of the survey, the American public viewed the computer in terms of two belief-attitude dimensions, the first of which was an instrument of man's purposes -- helpful in science, industry, space exploration, etc. The second dimension portrayed the computer as a relatively autonomous entity that can perform the functions of human thinking. Presumably, this latter dimension is the one that contributes to a feeling of inferiority with regard to computers. Future improvements to the questionnaire offered here should include items that attempt to tap more directly into this dimension, especially in view of the fact that, despite their high evaluations of the computer, means for the anxiety question (where 1 equals extremely anxious and 5 equals completely comfortable) were slightly lower (3.45 for faculty and 3.59 for students), indicating greater anxiety.

Needless to say, because this questionnaire is still in the construction stage, our sample of respondents is small and these data ultimately may not be representative of faculty and students at the College of Charleston.

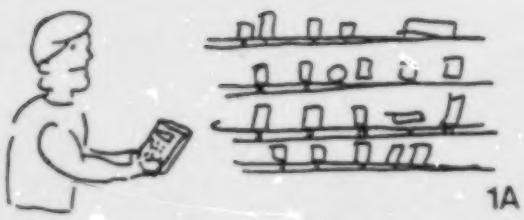
It was discovered that this particular measurement instrument took only an average of ten minutes to complete; consequently, a subsequent version will probably include at least one additional anxiety scale. It has been reported by Raub (1981) that correlates of computer anxiety in her study included not only gender, level of computer experience, and college major, but math anxiety and trait anxiety as well. It would be interesting to explore the nature of this relationship further, using, perhaps the Mathematics Anxiety Rating Scale (MARS) of Richardson & Suinn (1972) and/or the State-Trait Anxiety Inventory (STAI) of Spielberger and Gorsuch, 1970).

Of the innumerable important hypotheses that can be generated and tested with appropriately constructed surveys; the following three issues are highlighted as meriting particular attention:

(1) There is a growing need to identify what is meant (contextualized) by the word "computer". It has been pointed out by Lee (1970) that the computer "is a complex and ambiguous stimulus - how individuals perceive it and give meaning to it depends very much on their fundamental values, on their personality dynamics, and on their basic orientations toward life" (p 59). It should be added that prior exposure and experience also affect what computers mean to us, and these factors can vary widely among individuals in our culture. Figure 1 consists of some representative responses to the "Draw a Computer Test". Notice that computers include hand-held (A), desk-top (B), and room-sized (C) items and appear in what are described as grocery stores (A), family rooms (D) and dorm rooms (E). It is incumbent upon any researcher of computer phobia to specify something about the nature of the feared object or events for each individual studied.

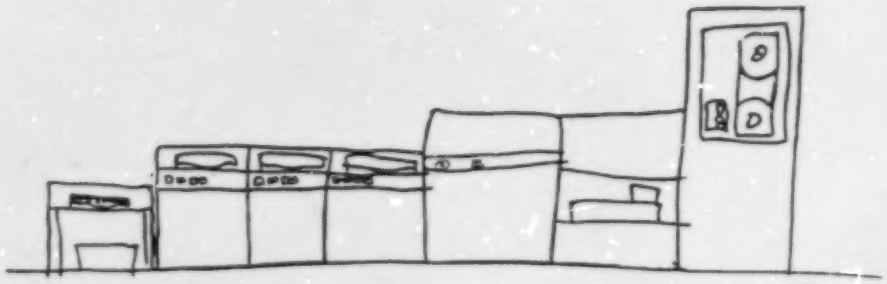
(2) We must clarify the relationship between various kinds of anxiety and behavior toward computers. It was implied earlier that math, state, or trait anxiety might be related to computer phobic behaviors. Alternatively, there is a common stereotype of the computer "hacker" (addict) as a socially anxious individual who prefers contact with computers to contact with people, taking refuge in the rule-determined, precise, measured, unemotional, and completely predictable responses of a machine. From another perspective, the socially anxious person may compensate for a lack of human contact with increasingly sophisticated computer approximations of human interactions.

It may also be the case (see Figure 2), that the socially anxious person generalizes his/her fear of human interactions to these often human-like machines. After all, both man and machine tend to demand correct responses; computers typically permit even less latitude than even the most demanding conversational partners. The features of computers that attract some socially anxious individuals may act to create additional "social" anxiety for others. In other words, social anxiety may motivate some individuals to "move toward" computers and others to "move away". That computers can be viewed as demanding conversational partners is suggested by some of the responses to the Draw-A-Computer Test described earlier (See Figure 3).



1A

1B



1C

1D

1E

Figure 1. Sample responses to the "Draw-A-Computer" Test.

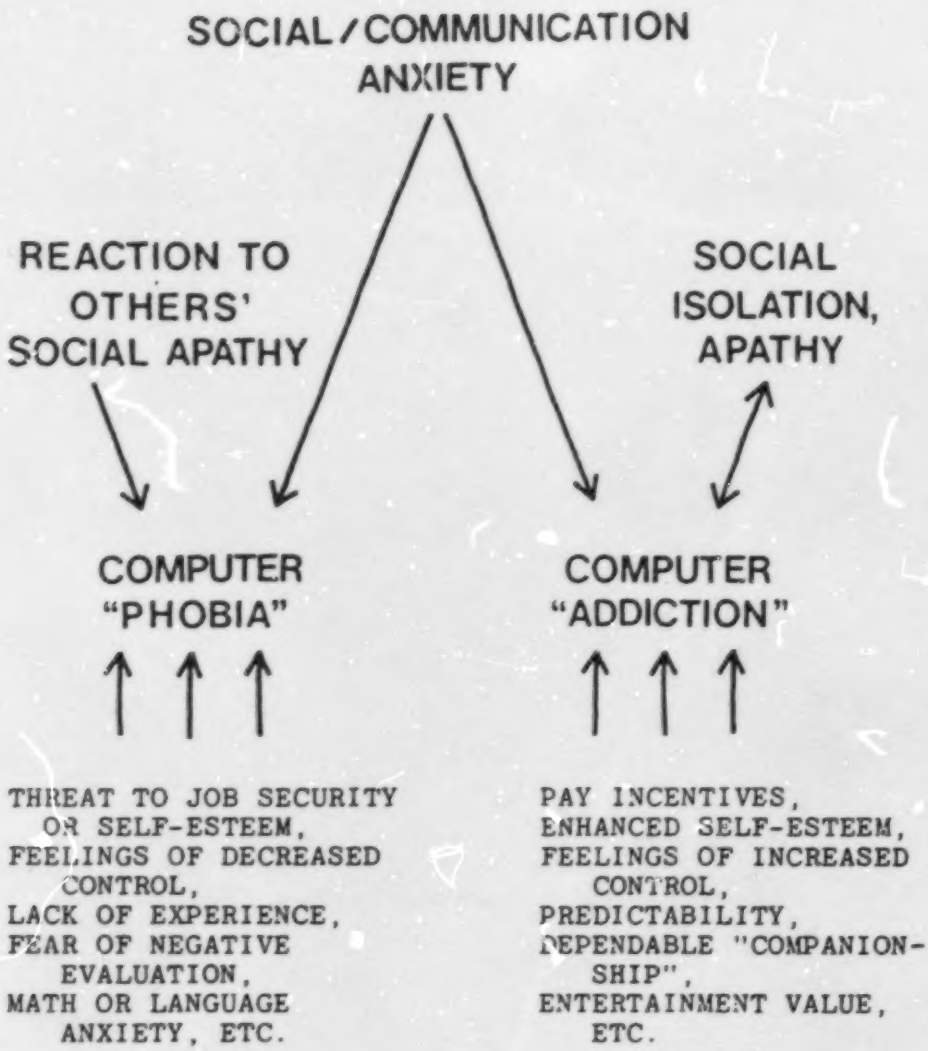


FIGURE 2. SOME FACTORS HYPOTHESIZED TO AFFECT "PHOBIC" AND "ADDICTIVE" BEHAVIORS TOWARD COMPUTERS.

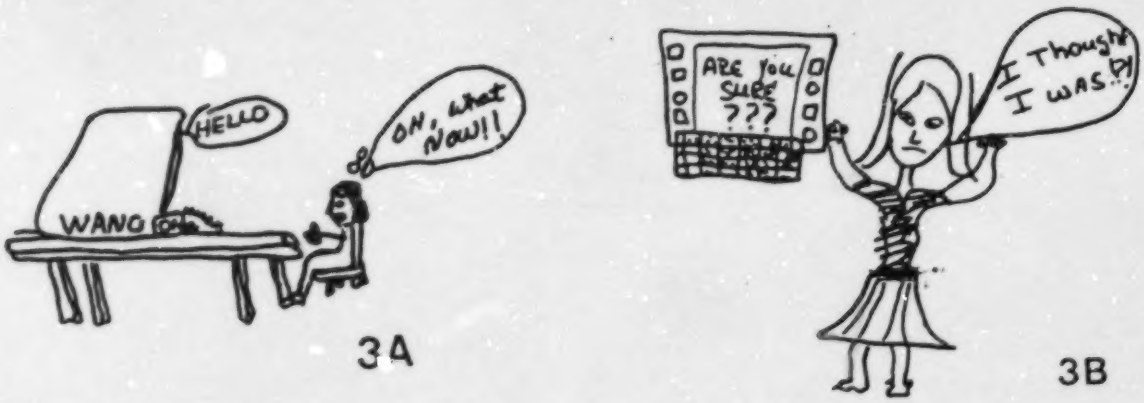


Figure 3. Conversations with the computer. Sample responses to the "Draw a Computer Test".

It would be useful to explore the relationship between computer behaviors/attitudes and a number of related "social anxiety-type" constructs; for example: communication apprehension, (McCroskey's (1970) Personal Report of Communication Apprehension (PRCA)); shyness, (Pilkonis' (1977) Stanford Shyness Survey); and social anxiety, (Watson and Friend's (1969) Fear of Negative Evaluation (FNE) and Social Avoidance and Distress Scale (SAD)).

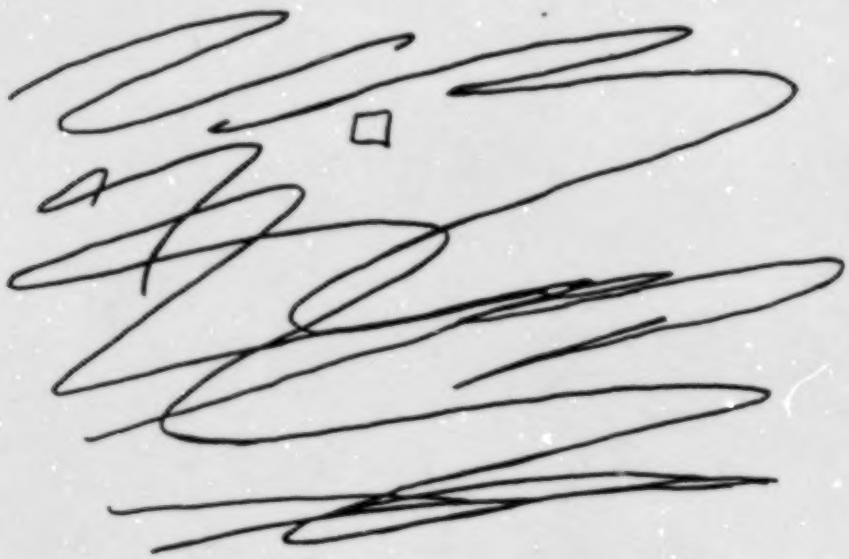
(3) We must consider the possibility that computer phobia (avoidance?) may be functional. An interesting "dialogue" among computer hackers writing "on-line" was published a few years ago (The Hacker Papers; 1980) wherein computer "addicts" contemplated their motivations and deviations. The article was followed with one by the notable social psychologist, Philip Zimbardo, who claimed that "in society as a whole, the hacker mentality is upon us, with or without the computer as a rationalization for putting other people at the bottom of our priority stack. There are forces at work in society increasing both the sense and the reality of our separateness from one another." (p. 71)

Zimbardo explains that he once felt that this separateness was exclusive to the timid and shy, who were the subjects of his research on shyness. Then he began to observe that within his comparison group of non-shys was a large proportion of people claiming an "apparently unmotivated indifference -- unlike the shys, they do not mind being isolated; they lack spontaneity, personal achievement, joy in sharing feelings with a friend." Zimbardo feels that this alienation, anomie, and isolation are products of our times, with its increasing technology, fierce competition, transient population, overcrowding, and breakdown of the family structure. If this is true, some anxiety about the computer may actually stem from a realistic appraisal of the role it plays as one of the current dangers to human social interactions. Furthermore, in "addictive" computer behavior, we may be seeing the transformation of what was once social anxiety into social apathy. Because of its abilities to mimic social interaction and because of the predictability of its responses, computers may act, at least minimally, to meet our needs for one another without the additional burden of the demands we place on each other. In addition, knowledge of computers can offer a number of positive incentives; job security, high pay, a sense of "control", dependability, etc. (see Figure 2). Wilkes (1984) points out that many computer-critics also argue that computers threaten us intellectually and even spiritually, and he

believes that the "computerphobes" are still "fighting the good fight" against the "computerphiles". Brod (1984), another critic of computers, nevertheless believes we lose whether we love or hate computers; "technoanxious" persons feel threatened and alienated; "techno-centered" persons become increasingly dehumanized.

Authors have compared the computer and its impact to, among other things, the telephone, the automobile, television, the family dog, the family, and friends and acquaintances (when you want to widen your circle of friends, just buy more hardware!) -- to name a few. Of all the descriptions and analogies I've encountered, I think one of my survey respondents said it best -- and gave the best reason for why intensive efforts to study our relationship with computers is so essential. Until we fully understand it, the computer will remain

a.) In the space below, please draw a scene with a computer in it.



b.) Now, in your own words, please give a brief description of the scene you drew.

A small box with a lot of mystery surrounding it.

BEST COPY AVAILABLE

References

Brod, C. (1984). Technostress: The Human Cost of the Computer Revolution. Reading, MA: Addison-Wesley.

Eysenck, H. J. and Eysenck, S. B. G. (1969). Personality structure and measurement. London: Routledge & Kegan Paul.

The Hacker Papers. (1980, August). Psychology Today, p. 62-69.

Harris, D. B. (1963). Children's drawings as a measure of intellectual maturity: A revision and extension of the Goodenough Draw-A-Man Test. New York: Harcourt Brace Jovanovich.

Lee, R. S. (1970). Social attitudes and the computer revolution, Public Opinion Quarterly, 34, 53-59.

McCroskey, J. C. (1970). Measures of communication -- bound anxiety. Speech Monographs, 37, 269-277.

Pilkonis, P. A. (1977). Shyness, public and private, and its relationship to other measures of social behavior. Journal of Personality, 45, (4), 585-595.

Plake, B. S. and Parker, C. S. (1982). The development and validation of a revised version of the mathematics anxiety rating scale. Educational and Psychological Measurement, 42, 551-557.

Raub, A. C. (1981). Correlates of computer anxiety in college students. Dissertation Abstracts International, 42, DA8208027.

Reece, M. J. and Gable, R. K. (1982). The development and validation of a measure of general attitudes toward computers. Educational and Psychological Measurement, 42, 913-916.

Richardson, F. C. and Suinn, R. M. (1972). The mathematics anxiety rating scale: Psychometric data. Journal of Consulting Psychology, 19, 551-554.

Smith, R. E. and Sarason, I. G. (1975). Social anxiety and the evaluation of negative interpersonal feedback, Journal of Consulting and Clinical Psychology, 43 (3), 429.

Spielberger, C. D., Gorsuch, R. L. and Lushene, R. E. (1970). Manual for the state trait anxiety inventory, Palo Alto, CA: Consulting Psychologist Press.

Spielberger, C. D., O'Neil, H. F., Jr., and Hansen, D. N. (1972). Anxiety, drive theory, and computer-assisted learning. In B. A. Maher (Ed.), Progress in experimental personality research, Vol. 6 New York: Academic Press. (p. 109-148).

Steele, Guy L., Jr. (1983). The hacker's dictionary: A guide to the world of computer wizards. New York: Harper & Row.

Triandis, H. C. (1971). Attitude and attitude change. New York: Wiley.

Watson, D. and Friend, R. (1969). Measurement of social-evaluative anxiety, Journal of Consulting and Clinical Psychology, 33 (4), 448-457.

Wilkes, J. (1984). Computerworld: Love it or leave it. Psychology Today, 18 (4), 72-73.

Zimbardo, P. G. (1980). The age of indifference. Psychology Today, 14 (3), 71-76.

Perspectives on Computers
Questionnaire

As computers become more and more common in our society, it becomes important to try to discover how they can be used best. In order to do this, we must learn about how people currently use computers, as well as how they feel about them. Toward this end, in completing this questionnaire, you are being asked to do four things:

I.) Depict scenes that include a computer.
II.) Answer some questions about computers.
III.) Respond to some questions about computers.
IV.) Indicate your feelings about computers.

Each of the four parts of this questionnaire includes the instructions you need to complete it. Please try to finish the entire questionnaire without taking a break. It should take approximately thirty minutes. Please finish each section, in order, without looking ahead or going back. Please answer each of the items in each section. If you are not sure of an answer, respond as best as you can. At the end of the questionnaire, there is a space where you can make any additional comments, or qualify or explain any of your responses if you desire.

I.) The following two items ask you to depict a scene that includes a computer. You may select a scene from your own experience or use your imagination to construct a scene.

a.) In the space below, please draw a scene with a computer in it.

b.) Now, in your own words, please give a brief description of the scene you drew.

II.) Computer knowledge. Identify each of the following statements below as "true" or "false" by circling the appropriate letter. If you find that you are guessing the answer, circle "don't know".

T	F	don't know	1. One way to enter data into a computer is to use punched cards.
T	F	don't know	2. In the late 1950's, solid state transistors replaced vacuum tubes in computers. Integrated circuits have since replaced transistors.
T	F	don't know	3. A microprocessor is another name for home computer.
T	F	don't know	4. A CRT terminal has a television-like screen. The user can provide input at a keyboard that is displayed on the CRT as well as receive output at the same terminal.
T	F	don't know	5. The process of writing a program for a computer is called "debugging".
T	F	don't know	6. FORTRAN, BASIC, and PASCAL are all names of computer programming languages.
T	F	don't know	7. The central processing unit (CPU) is the heart of the computer system.
T	F	don't know	8. Data are represented in the computer in binary digits.
T	F	don't know	9. Data for the computer can be stored on magnetic tape.
T	F	don't know	10. The term "online" refers to the time a computer system is not working because of equipment problems.
T	F	don't know	11. Floppy discs are designed to be used with a mini-computer.
T	F	don't know	12. "Software" refers to the pliable silicon components inside a computer.
T	F	don't know	13. Word processing simply means writing with a computer.
T	F	don't know	14. Units of work to be processed by a computer are referred to as "jobs".
T	F	don't know	15. A remote terminal is the final output printed by a computer after it completes a program.

III. Computer Experience

1. Have you ever used a computer? YES ____
NO ____

(If your answer is no, please skip to question #8.)

2. How long has it been since you FIRST used a computer?
less than one year ____
1 - 5 years ____
over 5 years ____
don't remember ____

3. Please circle the number that best represents your answer. For example, circling 3 would indicate that your experiences fell midway between "very negative" and "very positive".

In general, how would you describe your experiences with using the computer?

1	2	3	4	5
very negative				very positive

4. Do you currently use a computer? YES ____
NO ____

5. How much time do you spend using a computer?
less than 1 hour/week ____
1-5 hours/week ____
5-15 hours/week ____
15-30 hours/week ____
more than 30 hrs/wk. ____

6. Do you own your own computer? YES ____
NO ____

If yes, please list the model _____
If you own any extra equipment for your computer, please describe in the space provided.

_____

_____

7. In what capacity do you use a computer? Please use the list below to specify the percentage of computer-use time that you perform a particular activity. If you never use the computer as listed in any of the categories below, place a 0% on the corresponding line. REMEMBER YOUR NUMBERS SHOULD TOTAL TO 100%.

	personal computer	main frame computer
a. programming new software	____%	____%
b. modifying old software	____%	____%
c. analyzing research data	____%	____%
d. word processing	____%	____%
e. particular business functions (Please describe briefly _____)	____%	____%
f. using games and similar software packages	____%	____%
g. completing homework assignments in non-computer courses	____%	____%
h. Other (Please describe. _____)	____%	____%
	____% +	____%=100%

Questions 8 - 14 below can be answered by circling the number that best represents your answer. If your answer lies somewhere between the two end points, please circle the corresponding number.

8. In general, how would you describe your mathematical ability?

1	2	3	4	5
very poor				very good

9. In general, how would you describe your attitude toward using math?

1	2	3	4	5
very negative				very positive

10. How would you describe your ability to learn languages?

1	2	3	4	5
very poor				very good

11. How would you describe your attitude toward having to learn another language?

1	2	3	4	5
very poor				very good

12. In general, how would you describe yourself?

1	2	3	4	5
very shy				very outgoing

13. How would you rate your typing ability?

1	2	3	4	5
I can't type at all				I'm an expert typist

14. How often do you play video games (including home video games)?

1	2	3	4	5
never				every chance I get

15. Please check the term that applies to you:

student _____

faculty _____

secretarial staff _____

other _____ (Please specify _____)

Supplemental questions

Can you recommend any changes in this questionnaire that would result in better questions and/or would make the questionnaire easier to answer?

Please make any necessary additional comments about your responses to this questionnaire below.

IV. Attitudes Toward Computers

Generally speaking, computers can best be characterized as

1	2	3	4	5
a toy				a tool
a threat to society				an aid to society
a hindrance				a help
something I have no desire to learn about				something I desire to learn about as much as I can
something to be avoided				something to be used whenever possible

If I think about having to use a computer, I feel

1	2	3	4	5
extremely anxious				completely comfortable